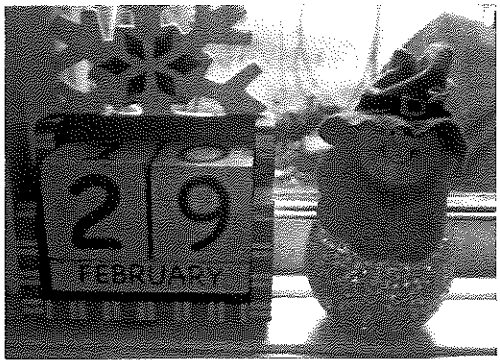


6. 4 Leap Year

A Practice Understanding Task

Carlos and Clarita are discussing their latest business venture with their friend Juanita. They have created a daily planner that is both educational and entertaining. The planner consists of a pad of 365 pages bound together, one page for each day of the year. The planner is entertaining since images along the bottom of the pages form a flip-book animation when thumbed through rapidly. The planner is educational since each page contains some interesting facts. Each month has a different theme, and the facts for the month have been written to fit the theme. For example, the theme for January is astronomy, the theme for February is mathematics, and the theme for March is ancient civilizations. Carlos and Clarita have learned a lot from researching the facts they have included, and they have enjoyed creating the flip-book animation.

The twins are excited to share the prototype of their planner with Juanita before sending it to printing. Juanita, however, has a major concern. "Next year is leap year," she explains, "you need 366 pages." So now Carlos and Clarita have the dilemma of needing to create an extra page to insert between February 28 and March 1. Here are the planner pages they have already designed.

February 28

A circle is the set of all points in a plane that are equidistant from a fixed point called the center of the circle.

An angle is the union of two rays that share a common endpoint.

An angle of rotation is formed when a ray is rotated about its endpoint. The ray that marks the preimage of the rotation is referred to as the "initial ray" and the ray that marks the image of the rotation is referred to as the "terminal ray."

Angle of rotation can also refer to the number of degrees a figure has been rotated around a fixed point, with a counterclockwise rotation being considered a positive direction of rotation.

March 1

Why are there 360° in a circle?

One theory is that ancient astronomers established that a year was approximately 360 days, so the sun would advance in its path relative to the earth approximately 1/360 of a turn, or one degree, each day. (The 5 extra days in a year were considered unlucky days.)

Another theory is that the Babylonians first divided a circle into parts by inscribing a hexagon consisting of 6 equilateral triangles inside a circle. The angles of the equilateral triangles located at the center of the circle were further divided into 60 equal parts, since the Babylonian number system was base-60 (instead of base-10 like our number system).

Another reason for 360° in a circle may be the fact that 360 has 24 divisors, so a circle can easily be divided into many smaller, equal-sized parts.

Part 1

Since the theme for the facts for February is mathematics, Clarita suggests that they write formal definitions of the three rigid-motion transformations they have been using to create the images for the flip-book animation.

How would you complete each of the following definitions?

1. A translation of a set of points in a plane . . .

2. A rotation of a set of points in a plane . . .

3. A reflection of a set of points in a plane . . .

4. Translations, rotations and reflections are rigid motion transformations because . . .

Carlos and Clarita used these words and phrases in their definitions: perpendicular bisector, center of rotation, equidistant, angle of rotation, concentric circles, parallel, image, pre-image, preserves distance and angle measures within the shape. Revise your definitions so that they also use these words or phrases.

Part 2

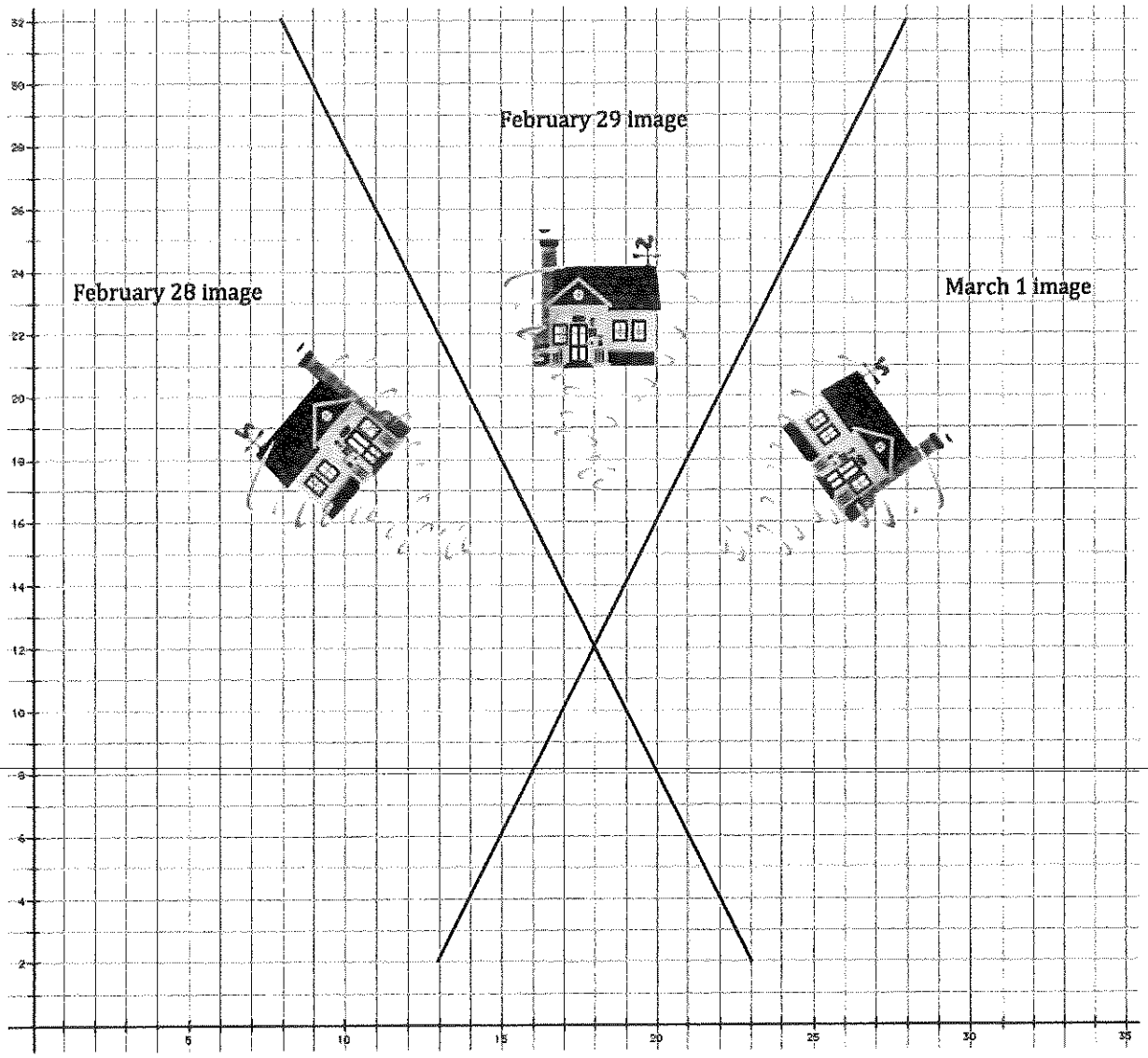
In addition to writing new facts for February 29, the twins also need to add another image in the middle of their flip-book animation. The animation sequence is of Dorothy's house from the Wizard of Oz as it is being carried over the rainbow by a tornado. The house in the February 28 drawing has been rotated to create the house in the March 1 drawing. Carlos believes that he can get from the February 28 drawing to the March 1 drawing by reflecting the February 28 drawing, and then reflecting it again.

Verify that the image Carlos inserted between the two images that appeared on February 28 and March 1 works as he intended. For example,

- What convinces you that the February 29 image is a reflection of the February 28 image about the given line of reflection?

- What convinces you that the March 1 image is a reflection of the February 29 image about the given line of reflection?

- What convinces you that the two reflections together complete a rotation between the February 28 and March 1 images?



Images this page:

http://openclipart.org/detail/168722/simple-farm-pack-by-viscious-speed

www.clker.com/clipart.tornado-gray

READY, SET, GO! Name Period Date

READY

Topic: Defining polygons and their attributes
For each of the geometric words below write a definition of the object that addresses the essential elements.

1. Quadrilateral:

2. Parallelogram:

3. Rectangle:

4. Square:

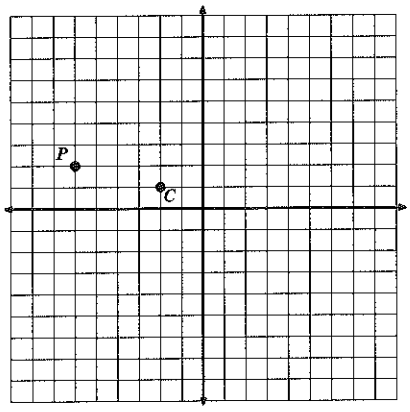
5. Rhombus:

6. Trapezoid:

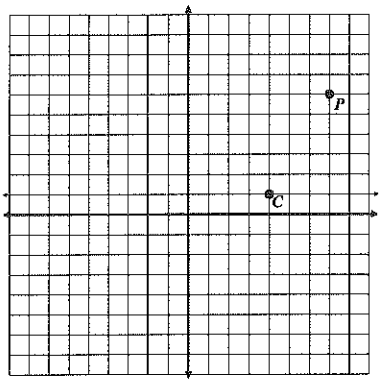
SET

Topic: Reflections and rotations, composing reflections to create a rotation.

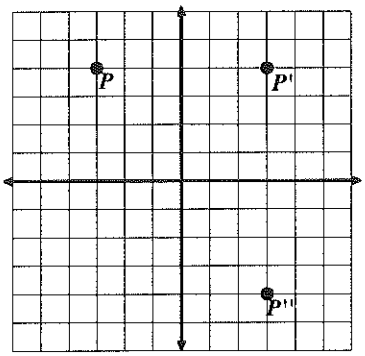
7.



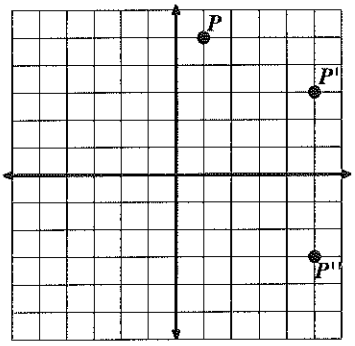
Use the center of rotation point ***C*** and rotate point ***P*** clockwise around it 90⁰. Label the image ***P'***. With point ***C*** as a center of rotation also rotate point ***P*** 180⁰. Label this image ***P''***.

8. 

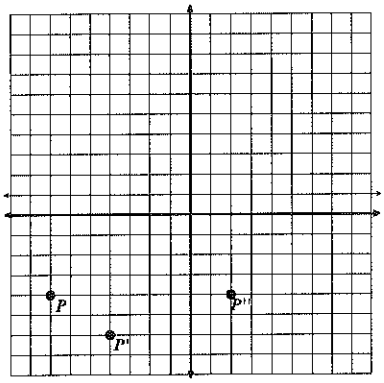
Use the center of rotation point ***C*** and rotate point ***P*** clockwise around it 90°. Label the image ***P'***.
With point ***C*** as a center of rotation also rotate point ***P*** 180°. Label this image ***P''***.

9. 

a. What is the equation for the line for reflection that reflects point ***P*** onto ***P'***?
b. What is the equation for the line of reflections that reflects point ***P'*** onto ***P''*** ?
c. Could ***P''*** also be considered a rotation of point ***P***? If so what is the center of rotation and how many degrees was point ***P*** rotated?

10. 

a. What is the equation for the line for reflection that reflects point ***P*** onto ***P'***?
b. What is the equation for the line of reflections that reflects point ***P'*** onto ***P''*** ?
c. Could ***P''*** also be considered a rotation of point ***P***? If so what is the center of rotation and how many degrees was point ***P*** rotated?

11. 

a. What is the equation for the line for reflection that reflects point ***P*** onto ***P'***?
b. What is the equation for the line of reflections that reflects point ***P'*** onto ***P''*** ?
c. Could ***P''*** also be considered a rotation of point ***P***? If so what is the center of rotation and how many degrees was point ***P*** rotated?

GO

Topic: Rotations about the origin.

Plot the given coordinate and then perform the indicated rotation in a clockwise direction around the origin, the point (0 , 0), and plot the image created. State the coordinates of the image.

12. Point A (4, 2) rotate 180°
    Coordinates for Point A' (___ , ___)

13. Point B (-5, -3) rotate 90° clockwise
    Coordinates for Point B' (___ , ___)

14. Point C (-7, 3) rotate 180°
    Coordinates for Point C' (___ , ___)

15. Point D (1, -6) rotate 90° clockwise
    Coordinates for Point D' (___ , ___)